

# **CHAPTER I - GENERAL DESIGN REQUIREMENTS**

## **110 REQUIREMENTS FOR PUBLIC IMPROVEMENTS**

### **110.1 GENERAL**

The purpose of this manual is to set standards for the construction of public improvements to serve new and future developments and for the reconstruction of existing facilities to upgrade existing infrastructure. These standards shall apply to all improvements within the public right-of-way, to all improvements required within the proposed public right-of-way of new subdivisions, for all improvements intended for maintenance by the City, and for all other improvements for which the City Code requires approval of the City Engineer or designee. These include street, bikeway, drainage, water, and sanitary sewer improvements as required by the development review process, City Ordinance, and other City policies adopted by the City Council or the Director. Standards for site grading, erosion control, parking lot and driveway construction on private property are also contained in this manual and the City Code.

The standards contained in this manual are intended as guidelines for designers and developers in preparing their plans, and for City staff in reviewing plans. Where minimum values are stated, greater values should be used whenever practical; where maximum values are stated, lesser values should be used where practical. In some locations, due to existing development or unusual topography, conformance to these standards may impose an unusual hardship. In such locations, the City may approve modifications to the standards, or a variance from the standard, as allowed by law.

The City has adopted standard construction specifications, including standard drawings. The standard specifications and standard drawings should be used in the design and construction of improvements intended for public use and maintenance in the City. Where the design standards, standard specifications, or standard drawings do not cover improvements, the City Engineer or designee shall establish appropriate standards.

No work regulated by the City's codes shall commence prior to the completion of the required Board of Design Review (BDR), approval of the construction plans, and issuance of the appropriate permit(s). A Site Development Permit (SDP) will be issued at the pre-construction conference (with the City Senior Engineering Inspector, Owner, Engineer of Record, and General Contractor) only if the following steps have been completed satisfactorily:

- A. Completion of Board of Design Review (or other appropriate land use approval, including appeal periods).
- B. Performance of all Conditions of Land Use Approval that must be met prior to issuance of the permit.
- C. Approval of the construction plans by the City (completion of the City Engineering Plan Review and approval process).
- D. Submittal of acceptable calculations and other supporting documents to the City Engineer, when such documents are requested.
- E. Approval of the detail cost estimate by the City.
- F. Approval of the performance security by the City.
- G. Submittal and approval by the City of the complete and signed Developer/Engineer Agreement.
- H. Submittal of the subdivision plat, if the project is a subdivision.
- I. Submittal of the subdivision agreement, if the project is a subdivision.
- J. Approval of all legal documents, easements, and other documents as required by Facilities Review Committee or BDR comments.
- K. Submittal of an acceptable site development deposit, erosion control fees, and floodplain modification fee, if the project involves a floodplain modification.
- L. Submittal of copies of permits from all other affected governmental jurisdictions.
- M. Completion of all appeal periods (land use approval and floodplain modification notices).

Property owners, developers and others proposing to do any work on the site that will change it to a significant degree (as defined by the City, and including those changes itemized in Ordinance 2050 and Chapter 9 of the Beaverton City Code) will be required to obtain a Board of Design Review approval, complete all of the aforementioned steps, and obtain a Site Development Permit or Right-of-Way Permit, as appropriate, before commencing work.

Designs submitted shall be stamped by a registered Professional Engineer licensed to practice in the State of Oregon. At the discretion of the City Engineer, registered Architects licensed to practice in the State of Oregon may be approved to stamp site grading, erosion control, parking lot, sidewalk, and driveway construction plans except in the following cases: a proposed floodway or floodplain modification; if the grading is under a fire access route as determined by the Fire Marshal; the cut or fill is greater than 2 feet from original ground level; or if it is in the public right-of-way. If the grading is closer than 10 feet from an exterior property line and it changes the ground surface more than 2 feet vertically, an evaluation by a soils engineer will be required. The soils engineer shall also provide an erosion control plan specifically outlining methods which

meet or exceed the minimums adopted by the Unified Sewerage Agency. In this case, an Architect's Oregon registration number must appear on or next to their professional stamp on each page submitted.

All public improvements and private streets, parking lots, sidewalks, and driveways shall be designed and constructed in such a manner as to be readily accessible to and usable by individuals with disabilities as per the requirements of the Americans With Disabilities Act of 1990. This includes providing curb ramps (City Standard Drawing 207) at intersections with pedestrian crosswalks to allow a smooth transition between street and sidewalk elevations.

## **110.2 PRECEDENCE OF DOCUMENTS**

If there is a conflict between approval documents, the document highest in precedence shall control. The precedence shall be:

First: Permits from other agencies or jurisdictions, as may be required by law.

Second: Facilities Review, Board of Design Review, Site Development Permit, and Planning Commission Conditions of Approval.

Third: City of Beaverton Engineering Design Manual and Standard Drawings.

Fourth: City of Beaverton Development Code (Ordinance 2050 and supplements).

Fifth: Unified Sewerage Agency Standards.

Sixth: Plans and details prepared by the design engineer.

Seventh: 1990 APWA Standard Specifications including the 1992 and 1996 revisions.

Eighth: Reference specifications.

Supplemental written agreements and approved revisions to plans and specifications by the appropriate jurisdictions will take precedence over documents listed above. Detailed plans shall have precedence over general plans. In any event, the determination of the City Engineer shall be final.

## **110.3 DESIGN LIFE OF IMPROVEMENTS**

The public water systems shall be designed to meet the minimum design life as defined in AWWA standards. The public sanitary and storm sewers shall be designed to meet the minimum design life as defined by the Unified Sewerage Agency. All other public improvements as defined by Beaverton Code 9.05.020 shall have a minimum design life of 20 years. It shall be the design engineer's responsibility to ensure that all improvements when built shall meet or exceed the requirements to achieve the above minimum design life.

## **120 SUBMITTAL REQUIREMENTS**

### **120.1 GENERAL**

- A. Submittal requirements consist of design plans, grading plans (where required), erosion control plans (where required), drainage calculations, and other information as required. Letters of transmittals shall accompany all submittals.
- B. The 1990 Standard Specifications and Drawings for Public Works Construction, Oregon Chapter, APWA including the 1992 and 1996 revisions are hereby adopted and incorporated as part of this document by reference except as modified herein.

### **120.2 DESIGN PLAN FORMAT**

- A. The plans shall be submitted on 24 x 36-inch sheets.
- B. Vicinity Maps shall be located on the first sheet of all plans and shall show the location of the project in respect to the nearest major street intersection.
- C. A north arrow shall be shown on each plan view sheet of the plans and adjacent to any other drawing which is not oriented the same as other drawings on the sheet.
- D. Site Development Plans shall be organized as follows:
  - 1. Title sheet to include project name, vicinity map, name and mailing address of developer/owner and engineering firm, general notes, notice to excavators, index, and space for city approval stamp (5 x 5-inch) in the lower right quadrant.
  - 2. Composite utility plan: Including existing public and private utilities, and proposed public improvements.
  - 3. Sanitary sewer and water: Including all backflow assemblies as required in Section 619 of this manual. A detail of these assemblies shall be included on the detail page.

4. Street and storm sewer, showing existing and finished contours at 2-foot intervals.
  5. Grading and erosion control plan with maximum contour intervals of 2 feet. Contours shall extend off site a minimum of 50 feet. This sheet shall also note the source of information, date of field work, and location of original document. Where possible, the grading plan shall be on one sheet.
  6. Approved preliminary plat - (if it is a subdivision)
  7. Landscape plan Including sidewalks, bikeways, retaining walls, irrigation, all underground utilities in the project and along all existing street frontages (See Section 210.18), and lighting.
  8. Details - All City Standard Drawings and details shall be full size, 75 percent or 66 percent of original size. Any modifications to a City Standard Drawing or detail must be clearly marked and initialed by the Engineer, along with the date of approval for modifications. Pre-approval is required for modifications to City Standard Drawings and details; see Section 160 of this manual.
- E. The scale shall be 1 inch = 2 feet, 3 feet, 4 feet, 5 feet, or 10 feet vertically and shall be 1 inch = 10 feet, 20 feet, 30 feet, 40 feet, or 50 feet horizontally for all drawings except structural details. Scale shall be shown with north arrow and within a title block.
- F. Letter size shall not be smaller than 0.10 of an inch high.
- G. The location and elevation of a National Geodetic Survey, United States Geological Survey, Oregon State Highway, Washington County, or City of Beaverton bench mark shall be shown. No other datum shall be used without permission of the City Engineer. Temporary control bench marks and elevations shall also be shown on the plans.
- H. A title block shall appear on each sheet of the plan set and shall be placed in the lower right-hand corner of the sheet, across the bottom edge of the sheet, or across the right-hand edge of the sheet. The title block shall include the names of the project, the engineering firm, the owner, the sheet title, and the sheet number.
- I. The seal of the registered Oregon Professional Engineer (or Architect as noted in Section 110.1) responsible for preparation of the plans shall appear on each sheet.

- J. The description and date of all revisions to the plans shall be shown on each sheet affected, and shall be approved and dated by the registered Professional Engineer of record as evidenced by an original signature or initial.
- K. Through use of standard drafting symbols, indicate the location and direction of view for all sections.

### **120.2.1 PLAN VIEW**

Plan views shall show the following:

1. Right-of-Way, property, tract, and easement lines (existing and proposed).
2. Subdivision name, lot numbers, street names, and other identifying labels. Subdivision and street names are subject to the approval of the City Planning Division, Fire Marshal's Office, and the County Surveyor.
3. Location and stationing of existing and proposed street center lines and curb faces.
4. Horizontal alignment and curve data of street center lines and curb returns.
5. Existing underground utilities and vegetation within the construction limits.
6. Location of existing buildings, wells, septic tanks, drain fields, fuel tanks, and any other buried structures. An ALTA survey shall be required for at least 100 feet surrounding any of the above items to remain.
7. Location, stationing, and size of all mains and service lines for storm drainage, sanitary sewer and water. Stationing shall be located in relationship to the street stationing at all manholes or other key locations.
8. Match lines with sheet number references.
9. Provisions for cross-connection control must be clearly shown on the plans, including any retro-fitting of existing water service connections and existing auxiliary water supplies, conversions to City of Beaverton water service that are required as a condition of development approval, upgrading of existing service connections by replacement of same, and any other cross connection control required by state and local rules and codes.
10. Street stationing to be noted at a minimum of 100-foot intervals.

11. Top of curb elevations along curb returns at quarter-deltas, and at 100-foot stations.
12. Location of the low points of street grades and curb returns.
13. Sidewalk locations. This shall include ramps, transitions in location or width, and relationship with driveways.
14. Crown lines along portions of streets transitional from one typical section to another.
15. Center line stationing of all intersecting streets.
16. Location and description of existing survey monuments, including but not limited to: section corners, quarter corners, donation land claim corners, and City bench marks.
17. Location of proposed street intersection monument boxes.
18. FEMA designated 100-year flood plains and flood ways, or areas of flooding during a 100-year storm event.
19. Wetland areas and storm water quality undisturbed corridors (buffer strips).
20. Legend
21. Developer's name, address and phone number.
22. Any additional information that the City deems necessary.

### **120.2.2 PROFILE VIEW**

Profile Views shall show the following:

1. Stationing, elevations, vertical curve data (including curve k factors), and slopes for center of streets or top of curbs. For off-set or superelevation cross-sections, both curbs shall be profiled. Where curbs are not to be constructed, center line of street and ditch inverts shall be shown.
2. Original ground along the center line and if necessary at the edges of the right-of-way if grade differences are significant.

3. Center line, top of curb, and gutter flow lines of existing streets for a distance of at least three hundred (300) feet each way at intersections with proposed streets. For stub streets that may be extended in the future, the vertical alignment shall be designed for at least 300 feet beyond the scope of the proposed construction. At the discretion of the City Engineer, additional design information concerning the vertical and horizontal alignment of future street extensions may be required.
4. Vertical alignment of streets, including existing center line monumentation.
5. The top of curb for all cul-de-sacs, eyebrows and curb returns.
6. All proposed drainage facilities, all invert and top elevations, slopes, materials, bedding, and backfill.
7. Existing drainage facilities, including off-site facilities, upstream and downstream that affect the design (i.e., downstream restrictions that back water on to project site). In addition, base flood elevations shall be shown on the profile.
8. Profiles for ditch and creek flowlines shall extend a minimum of two hundred (200) feet beyond the project, both upstream and downstream. Typical cross sections at fifty (50) foot intervals shall also be submitted.
9. Designate structures using alpha or numeric labels on profiles to correspond to plan view notation.
10. Profile for existing and proposed storm, sanitary, and water mains.
11. All existing and proposed sanitary, water, storm lines and other utilities crossing the profile.

### **120.3 SITE GRADING PLAN**

The City of Beaverton Code requires a site grading plan as part of the application for any development that involves the excavation or fill of greater than fifty (50) cubic yards of material. Grading contours (existing & proposed) shall be at no more than 2 foot intervals, and shall extend off-site a minimum of 50 feet. If the site topography warrants, 1 foot contours may be required by the City. The grading plan shall be prepared from recent ground surveys and include all existing and proposed surface drainage conveyances, storm drainage collection structures, and all storm drainage outfalls. The extent and limits of all proposed grading must be shown as a clearly delineated boundary (including but not limited to all catch points, grading limits for all excavations and fills, along with the limits of the proposed vegetation stripping). All slopes steeper

than 20% shall be shown as a ratio of horizontal run to vertical rise. This sheet shall also note source of information, date of field work, and location of original document.

All soil disturbing construction activity must adhere to the requirements of OAR 340-41-455. A detailed erosion control plan shall be shown in conjunction with the site grading plan.

The beginning of an excavation or the toe of a filled slope shall be located one-half its vertical height but not less than 10 feet from an adjoining property line. Request for waiver of this requirement may be made to the City Engineer by presentation of detailed plans along with appropriate substantiating evidence in the form of a written opinion of a soils engineer or engineering geologist to support justification for the waiver.

#### **120.4 DRAINAGE CALCULATIONS**

Drainage calculations shall be presented in a clear, concise and complete manner. These calculations shall address all runoff into the drainage system; areas contributing flow to each inlet must be computed separately and each inlet with contributing area shall be designated and shown on an accompanying contour map work sheet.

Initial time of concentration calculation with assumptions listed and charts or nomographs used shall be included with drainage calculations.

#### **120.5 OTHER REQUIREMENTS**

Other information to be shown on the construction drawings or the other submittals include:

1. The design assumptions for each street (ex: traffic coefficient, R-value).
2. The design elements such as:
  - A. Street classification;
  - B. Design speed;
  - C. Superelevation;
  - D. Average Daily Traffic (ADT) or Design Hourly Volume (DHV).
3. Structural construction plans and the necessary calculations shall be submitted for proposed structures (ex: walls, box culverts, bridges).
4. Any additional information that the City Engineer deems necessary to review the plans and assure compliance with design standards.

## **120.6 DETAIL SHEET**

A detail sheet shall be provided as part of the Site Development Plans. The detail sheet shall show all City Standard Drawings and special details necessary for the project.

All City Standard Drawings and details shall be full size, 75 percent, or 66 percent of original size. Any modifications to a City Standard Drawing or detail must be clearly marked and initialed by the Engineer, along with the date of approval for the modification. Pre-approval for modifications to City Standard Drawings and details is required; see Section 160 of this manual.

## **120.7 REVIEW PROCEDURE**

Seven (7) sets, or as directed by the City Engineer, of complete plans shall be submitted for review. Supporting information and documentation, such as drainage and water system calculations, shall also be submitted.

Upon completion of the detailed review by the City, the City will return one (1) set of plans with "Red Line" comments. After the private engineer has completed all revisions, seven (7) revised plans and the original "Red Line" plans shall be returned to the City.

Plan review priority will be given to plans submitted for final review. This plan review and approval is valid for one (1) year from the date of plan review fee payment. If a site development permit is obtained, approval is valid for two years from the date of the issuance of the site development permit. Extensions to the permit can be made as part of the Development Permit extension process (see the Development Code [Ordinance 2050]).

Plan approval means that the plans have been reviewed for reasonableness and compliance with minimum City specifications and standards. This approval does not supersede those standards and specifications, unless specifically varied by the City. Plan approval does not relieve the Engineer from responsibility for errors, omissions, or deficiencies in the plans.

## **120.8 AS-BUILT DRAWINGS**

Following completion of construction, the Engineer shall submit one (1) complete set of mylar as-built drawings. As-built drawings shall contain any and all revisions to the previously approved construction plans, and shall be accompanied by a completion certification letter from the Engineer. The completion certification letter shall accompany

the as-built plans and shall include a statement that the site and adjacent properties (as affected by work performed under the City permit) are stable with respect to settlement and subsidence, shallow and deep sloughing of cut and fill slopes, and the as-built improvements (public improvements, site grading and paving) meet or exceed the minimum design life as defined in section 110.3. If specialists were required in the design of the project (soils engineer, surveyor, arborist, wetland scientist, engineering hydrologist, etc.) then a completion certification from those individuals shall be required relating to their specialty. In addition, upon acceptance by the City, the site must either have all vegetation/landscaping established or all erosion control measures as needed based on the current Technical Guidance Handbook are installed and in good working order. Each sheet of the as-constructed drawings shall be stamped "As-Built", and signed and dated by the Engineer. This signature constitutes a certification that the public improvements, grading, and other elements of the engineered drawings have been completed in accordance with the City approved plans and to the standards of the City. As-Built shall be black India ink on originals or reverse reading, fixed-line, photographically reproduced 4-mil mylar, 24 x 36-inches in size and to engineering scale. Each sheet included in the construction plan shall be as-built. Sepia mylars or vellums will not be accepted.

- a. All public utility easements will be shown on the as-built.
- b. Distance between main lines in shared easements will be shown.
- c. Type of main line, size, and material will be shown.
- d. All laterals shall include length, plan stationing, size, material, and depths.
- e. Public sidewalk detail will be included.
- f. If project was designed on a CAD system, the City also shall receive a copy of all related drawings and documents (such as point files) in AutoCad format dxf or dwg, on disk.

Submission of as-built drawings shall be made prior to final inspection of a completed project.

## **130 STREET DESIGN**

### **130 .1 FUNCTIONAL CLASSIFICATION**

The functional classification of existing and proposed roads is established by the City of Beaverton Comprehensive Plan and is based on connectivity. Where the functional classification of a street is not identified in the City of Beaverton Comprehensive Plan,

the connectivity characteristics shall be used by the City to determine the functional classification of the street in question.

Streets shall be designed to the minimum standards of the Development Code and this manual. Development of the City's street design standards considered Metro's regional street design elements as delineated on Metro's Regional Street Design map and in Title 6 Section 2 of the Urban Growth Management Functional Plan. Metro's publication, "Creating Livable Streets: Street Design for 2040" (1997) is a resource.

### **130.2 ACCESS**

Access to public streets shall conform to the requirements of the City of Beaverton Comprehensive Plan and the Development Code. The City Engineer or designee shall have the authority to limit access and designate access locations on public streets under the jurisdiction of the City. Access to streets and highways under Washington County or State of Oregon jurisdiction must be formally approved by those entities at the applicant's initiative and expense.

### **130.3 WIDTH**

The street cross sections in Appendix B provide the minimum road width standards by functional classification of the road. It should be noted that public utility easements beyond the right-of-way are typically required.

### **130.4 NUMBER OF LANES**

The Comprehensive Plan identifies the number of lanes for each class of street. Additional lanes may be required at intersections in excess of the street sections shown in Appendix B.

Right-of-way may be needed in addition to that shown in the street cross sections in Appendix B to accommodate the increased number of lanes at intersections.

### **130.5 DESIGN SPEED**

Design speed shall be as follows:

Arterials	45 miles per hour
Collectors	35 miles per hour
Neighborhood Routes	25 miles per hour
Locals	25 miles per hour

Design speed is the maximum safe speed that can be maintained over a specified section of roadway when traffic, weather, and other conditions are so favorable that the design features of the roadway govern. The City Engineer or designee may approve a lower alternative design speed where it can be shown that the 85<sup>th</sup> percentile speed of traffic will be lower than the design speed standard during all hours. The design speed is the minimum speed that shall be used in design of safe road geometry. The design speed shall not prohibit the use of traffic calming features or signing, where appropriate, to encourage lower traffic speeds.

### **130.6 EASEMENTS**

- A. The minimum public utility and drainage easements for residential subdivisions shall be as follows:

A six-foot (6) public utility easement along all front lot lines, as shown on the local street section standards.

A three-foot (3) utility and drainage easement along all side and rear lot lines.

- B. Public water, sanitary sewer, and storm drainage lines on private property shall be centered within a permanent easement granted to the City, with a minimum width of fifteen feet (15) along its entire length. The actual required width of an easement may be greater than the minimum required as the required easement width shall be measured from the outside edge of the pipe zone to the catch point where a theoretical line at a 1:1 slope would daylight. No encroachment within a public utility easement of any private utility or structure shall be allowed without prior itemized approval. Under no circumstances, shall these items be placed within the pipe zone. Private utilities that cross public utility easements shall do so as close as practical to right angles with the public utility. The City can not approve any encroachment location which would adversely affect the ability of the City to maintain City utilities. Such easements, when directed by the City, shall be accompanied by temporary easements granted to the City of adequate width to allow construction of water and sewer. The Engineer or developer's surveyor shall provide the City with documents necessary to record the easements. The width of combination easements is evaluated at the site development permit stage on a case-by-case basis. It is within the authority of the City Engineer or designee to refuse to approve or sign any land partition, partition plat, or subdivision plat for a development that has not installed or completed the construction of the necessary

public infrastructure to serve the proposed and affected existing lots. Such approval may be withheld until it can be verified that the location and width of proposed rights of way and easements are adequate for the completed infrastructure.

C. Easements are subject to the approval of the City Attorney prior to recording. Variation from the City standard form of conveyance shall be allowed only when extraordinary circumstances warrant, as determined by the City Engineer and City Attorney.

D. All recording costs for easements created by private development shall be borne by the developer unless specifically agreed to by the City.

### **130.7 CITY MAPS / PLANS NOT GUARANTEED**

From time to time the City may provide property owners, engineers, contractors, and other members of the public with information from the City's archives. The City cannot guarantee and makes no representation that it has verified the accuracy of the measurements, locations, or other information on such maps and plans.

## **140 SURVEYING**

### **140.1 GENERAL**

This document, Section 105 of the APWA specifications, and ORS 209.140-150 define the requirements for protection of existing survey monuments during any construction and setting new survey monuments following construction of new streets, sewers, water and related works.

SOURCE: REFERENCE 13,14

The City Engineer may not approve or sign any land partition, partition plat, or subdivision plat until the necessary public infrastructure to serve the proposed and affected existing lots has been installed or has been guaranteed by a security acceptable to the City Attorney. It is within the authority of the City Engineer to refuse to approve or sign any land partition, partition plat, or subdivision plat for a development that has not installed or completed the construction of the necessary public infrastructure to serve the proposed and affected existing lots. Such approval may be withheld until it can be verified that the location and width of proposed rights of way and easements are adequate for the completed infrastructure.

### **140.2 EXISTING SURVEY MONUMENTS**

Whenever an existing section corner, one quarter section corner, or donation land claim corner monument or accessory, appears to be in danger of damage or destruction by any construction, the County Surveyor shall be notified in writing, not less than ten (10) working days prior to construction. The County Surveyor shall reference the monument prior to construction and replace it following construction. The County Surveyor shall be reimbursed for all expenses from said replacement by the party responsible for the construction.

As per ORS 209.150, no person shall willfully or negligently remove, destroy, or deface any existing survey monument. If damage cannot be avoided, the monument shall be referenced and replaced, under the direction of a registered Professional Land Surveyor, according to state law. A copy of the field notes referencing such monuments shall be provided to the City Engineer. Failure to comply with this provision is subject to penalty according to ORS 209.990.

SOURCE: REFERENCE 14

### **140.3 NEW SURVEY MONUMENTS**

All monuments within and adjacent to the public right of way shall not be offset unless prior approval from the City Engineer is received in writing. Center line monuments, as shown on Standard Drawing 103 shall be installed as required by Oregon Revised Statutes. The monuments shall be set by an Oregon registered Professional Land Surveyor. When monuments are set by a registered Professional Land Surveyor, a record of survey shall be filed complying with ORS 209.250 and any additional requirements set forth by the City. If a monument box is used, or required to be used by the City, it shall not be less than eight (8) inches inside diameter and shall be approved by the City Engineer before its installation.

Other center line monumentation shall be installed in accordance with current survey practices, and if within a hard surfaced area shall have metallic caps stamped with the registered business name or the letters "L.S." followed by the registration number of the surveyor in charge. Public street intersections or private street/public street intersections shall be monumented in a City Standard monument box.

#### **140.4 GLOBAL POSITIONING SYSTEM (GPS) SPECIFICATIONS**

The following are the minimum requirements for work done utilizing Global Positioning System (GPS) surveying techniques.

All work shall conform to ORS 93.320, ORS 93.330 (1)(c), ORS 93.350 and to the use intended in ORS 92.050 (9).

All work shall be performed under the direct supervision of a surveyor registered to practice in the State of Oregon.

All work shall conform to the guidelines set forth in the latest version of the GEOMETRIC GEODETIC ACCURACY STANDARDS AND SPECIFICATIONS FOR USING GPS RELATIVE POSITIONING TECHNIQUES, Federal Geodetic Control Committee.

All values shall be based on the North American Datum of 1983 (1991 Adjustment) (NAD 83(91)) and expressed both as Geodetic Coordinates and State Plane Coordinates and both in Meters and International Feet.

The minimum relative positional accuracy between all monuments established and the City of Beaverton Horizontal Control Network, after the constrained adjustment, shall be what is generally referred to as Second Order, Class I; more specifically, a maximum of twenty parts per million (20 ppm). (First Order accuracy requires a maximum of 10 ppm).

All horizontal values shall be based on National Geodetic Survey (NGS) First Order (or better) control monuments, equivalent monuments accepted by and recorded with the Washington County Surveyor, or monuments that are a part of the Washington County Geodetic Control Network. All vertical values shall be based on control points supplied by the City. A minimum of two horizontal and two vertical control monuments shall be used.

All monuments shall be a standard City of Beaverton "GPS Monument" (Standard Drawing 104), unless an existing monument is specified at a certain location or an exception is granted by the City Engineer. If the proposed location of a monument is in the same position as a monument that is to be set as a part of another aspect of the project, the work shall be coordinated so that the "Standard GPS Monument" is the physical monument used at that location. All monuments shall have a name designation provided by the City. All monuments are to be set by the contracting surveyor unless otherwise specified or arranged with the City.

Prior to commencement of field work, the GPS surveyor shall visit each proposed monument location and perform those field and office checks required to insure the acceptability of the monument locations. If any adverse conditions exist that might compromise the quality of the field work, they shall be reported to the City Engineer and corrective action discussed.

The GPS surveyor shall file with the Washington County Surveyor a survey, separate from any others required on the project, showing the following minimum information:

- Description of the monuments set or utilized on the project.
- Location descriptions of the monuments set or utilized on the project.
- A network diagram.
- Values of all monuments established or utilized on the project.
- A statement of relative positional accuracy (in relation to the City of Beaverton Horizontal Control Network) for each monument established, expressed in parts per million (ppm).
- All information that might be required by future work to conform to this specification.
- Any additional information that might affirm the integrity of the survey.
- Any additional information required or requested by the County Surveyor.

The City Engineer shall be provided with a digital and paper copy of the document filed and its assigned Washington County Survey number.

## **150 STRUCTURAL DESIGN**

### **150.1 GENERAL**

Structures not included in the Standard Drawings of this document shall be designed and constructed in accordance with the requirements of the Structural Design Section of the Oregon State Highway Division or ODOT. These Standards are referenced in ODOT's BRIDGE DESIGN MANUAL AND ACCOMPANYING STANDARD DRAWING, STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, and STANDARD DRAWINGS FOR DESIGN AND CONSTRUCTION.

SOURCE: REFERENCES 9, 15, and 16.

The project special provisions shall specify the APWA or ODOT requirements for bridges and other structures that apply to the specific project. The Uniform Building Code (UBC) and/or the American Concrete Institute Codes, Specifications, and Guidelines (ACI) shall govern those structures not addressed by the above.

## **160 DESIGN MODIFICATIONS**

### **160.1 MODIFICATION PROCESS**

#### **160.1.1 SUBMITTAL**

Requests to modify City Standards shall be submitted in writing by the Project Engineer to the City Engineer or designee. This written request shall state the desired modification(s), the reason(s) for the request(s), and a comparison between the specification(s), standard(s), and the modification(s).

Any request for modification or variance of City Standards should be documented with reference to nationally accepted specifications/standards. Requests to modify street design cross sections shall be allowed per the Development Code Section on Street Design Modifications, and shall document consideration of Metro's Regional Street Designs, as delineated in "Creating Livable Streets - Street Design Guidelines for 2040."

#### **160.1.2. REVIEW**

The request to modify shall be reviewed by the City Engineer or designee, who shall consult the appropriate review authorities and make one of the following decisions:

- Approve as is,
- Approve with changes,
- Or deny with an explanation.

The modification, if approved, is for project specific use. Approval of a request shall not constitute a precedent.

#### **160.1.3 APPEAL**

The applicant may appeal the City Engineer's decision to the City Council (Beaverton Code 9.05.016).

#### **160.1.4 CRITERIA FOR MODIFICATION OF SPECIFICATION STANDARDS**

The City Engineer or designee may grant a modification to the adopted specifications or standards when any one of the following conditions are met:

The specification or standard does not apply in the particular application.

Topography, right-of-way, or other geographic conditions impose an economic hardship on the applicant and an equivalent alternative which can accomplish the same design is available that does not compromise public safety or accessibility for the disabled.

A change to a specification or standard is required to address a specific design or construction problem which if not enacted will result in an undue hardship.

## **160.2 METRIC STANDARDS**

City standards are presented in English units. The City Engineer or designee may approve equivalent standards in metric units. In calculating the metric equivalents, the City Engineer or designee may round the figures to a level of accuracy equivalent to that of the original standard; provided, rounding of the metric units shall not cause a deviation greater than 3% between the English and metric values.

## **170 CONSTRUCTION SPECIFICATIONS**

### **170.1 GENERAL**

All public improvements shall be inspected by an Oregon registered Professional Engineer or a qualified individual under the supervision of an Oregon registered Professional Engineer (exceptions to this are as noted in Section 110.1). The City will not authorize work to begin on public improvements, site grading, or parking lot construction without designation of an engineer's inspector at the City's pre-construction conference. All inspection costs, including required testing, shall be paid by the owner or developer.

Engineering firms, and all employees of such firms, must be financially independent of the owner or developer and have no actual or perceived financial interest that is contingent on the outcome of its work. The engineer's relationship to the project must be solely that of an independent, professional service nature.

It shall be the policy of the City of Beaverton Community Development and Public Works Departments to provide "spot check only" inspection services for privately funded public improvements.

The work hours for all items covered by the site development permit shall be from 7:00 A.M. to 6:00 P.M. Monday through Friday. The City Engineer may allow longer or require shorter work hours depending on site-specific conditions. (The City shall observe the following holidays; New Years Day, Martin Luther King Day, President's

Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, Day after Thanksgiving, and Christmas Day. These holidays shall be considered as Sundays or other legal holidays. Should City Hall be closed by order of the Mayor due to inclement weather, natural disaster, or national security, those days shall also be considered as Sundays or other legal holidays.)

In order to perform work covered by the Site Development Permit outside the above days and hours, or on holidays, the Developer or Engineer of Record (or contractor if accompanied by a written authorization by Developer) shall request in writing (on forms supplied by the City Engineer) at least two full working days prior to the requested day. This request shall indicate what special circumstances requires the work to be performed outside the standard work week as described above. To be valid, the City Engineer's approval must be in writing and this approval shall be posted at the site on the approved work day, and a copy of it shall be submitted with the Engineer of Record's daily report to the City Inspector. Requests made with less than two days notice may not be approved if the City Engineer or his designee is not available.

#### **170.1.1 SUBSTITUTION OF MATERIALS**

It is not the intent of this Manual to exclude other equipment or materials of equal value, quality, or merit. Whenever a product is designated, or manufacturer's name, brand, or item designation is given or described, it shall be understood that the words "or approved equal" follows such name, designation, or description, whether in fact they do so or not. Determination of quality in reference to the project design requirement will be made by the City Engineer. A contractor shall not use an "equal" product without prior written approval of the City Engineer. A similar process as outlined in Section 160 will need to be followed.

#### **170.2 CITY INSPECTOR'S ACTIVITIES**

Inspecting services provided by the City shall include:

1. Acting as a liaison between the inspecting engineer and the City.
2. Monitoring both work progress and performance testing results.
3. The performance of administrative and coordination activities as required to support the processing and completion of the project.
4. The issuance of a stop work order by notice to the engineer's inspector to stop the work. If the engineer's inspector is not available, the City's Project Inspector, at the discretion of the City Engineer, may post a stop work order.

5. Maintaining a completion file containing the following:
  - a. The original of the project completion certification;
  - b. A complete copy of the log book initialed by the engineer's inspector;
  - c. The results of material tests, compaction tests, and soil analysis as detailed in the log book.
6. Inform the City Development Services Engineer of all proposed plan changes, material changes, stop work orders, or errors or omissions in the approved plans or specifications as soon as practical. Any revision to approved plans must be under the direction of the Engineer. It shall be at the discretion of the City's Project Inspector as to whether the revision is significant enough to warrant review by the City Engineering Plan Review/Permits Unit. If so, the Engineer shall submit five (5) copies of the proposed revision; no work affected by the revision shall be done until approval by the City Development Services Engineer.

### **170.3 INSPECTING ENGINEER'S ACTIVITIES**

The following minimum activities are required of the designated inspecting engineer:

1. Maintain a project log book of daily inspection reports which contain the following information:
  - A. Job number and name of Engineer and designees.
  - B. Site development permit number.
  - C. Date and time (arrival and departure) of site visits.
  - D. Weather conditions, including temperature.
  - E. A description of construction activities.
  - F. Statements of directions to change plans, specifications, stop work, reject materials, or other work quality actions.
  - G. Public agency contacts which result in plan changes or other significant actions.
  - H. Perceived problems and action taken.
  - I. Final and staged inspections.
  - J. Record all material and soil types and conditions.
  - K. Test results.
  - L. Record all pavement grade and depth measurements by street stationing.
  - M. General remarks including citizen contact or complaints.

All active site development projects will be required to turn in daily inspection reports to the City on a weekly basis containing information as outlined above. If the compiled

reports become more than two weeks in arrears, or are significantly deficient as determined by the City Engineer, a stop work order may be posted on the project site.

2. Obtain and use a copy of City-approved construction plans, specifications, and a copy of this manual.
3. Review and approve all pipe, aggregate, Portland cement concrete, asphaltic concrete, and other materials to ensure their compliance with City standards.
4. Approve all plan or specification changes in writing and obtain City approval (see City Inspector's Activities above). All changes to the approved plans or specifications must be with the approval of the City prior to the commencement of work affected by the revision.
5. Monitor construction activities to ensure end products meet City specifications.
6. Perform (or have performed) material, composition, and other tests required to ensure City specifications are met.
7. For pavement construction, perform the following stage inspections and record date of each:
  - A. Curbs are built to line and grade.
  - B. Subgrade meets grade and compaction specifications.
  - C. Base rock meets depth/thickness, grade, and compaction specifications.
  - D. Leveling course meets depth/thickness, grade, and compaction specifications.
  - E. Wearing course meets depth/thickness, grade, and compaction specifications.
  - F. Provide the City with 24-hour notice of impending stage inspections.
8. Prior to requesting any building occupancy on commercial, multi-family, and/or other projects with concurrent site development and building permits, the engineer shall certify that all necessary public improvements have been installed and accepted in compliance with the City approved site development plan. This certification shall also indicate that all items required (at or before occupancy of the first building) through the land use process has been completed (including the recording of all public utility easements).

#### **170.4 SAFETY REQUIREMENTS**

The contractor is responsible for observing the safety of the work and of all persons and property coming into contact with the work. The contractor shall conduct his work in such a manner as to comply with all the requirements prescribed by OSHA. Traffic

control in work zones shall conform to the MUTCD. At the City's discretion, a traffic control plan shall be submitted and approved prior to construction.

The City Project Inspector's role is not one of supervision or safety management, but is one of observation only. Nothing contained in this section or elsewhere in this book shall be interpreted to obligate the City to act in any situation, nor shift the owner's responsibility for safety compliance to the City. No responsibility for the safety of the work or for construction means, methods, techniques, sequences, or procedures shall attach to the City by virtue of its action or inaction under this section.

## **170.5 SCHEDULING**

### **A. Sequence of Operations.**

The Contractor shall plan construction work and execute his operations with a minimum of interference with the operation of the existing public facilities. It may be necessary to do certain parts of the construction work outside normal working hours in order to avoid undesirable conditions, and it shall be the obligation of the Contractor to do this work at such times. This scheduling, however, is subject to the City's approval and does not relieve the contractor from making work available for inspection.

The Contractor shall notify the City at least 48 hours (two full working days) prior to any City Inspection. Connections between existing work and new work shall not be made until necessary inspection and tests have been completed on the new work and it is found to conform in all respects to the requirements of the plans and specifications.

### **B. Progress of Construction.**

Construction shall proceed in a systematic manner that will result in a minimum of inconvenience to the public.

In the case of a pipe-laying job for sanitary sewer, storm drainage, and water improvements the trenching equipment at no time shall be greater than 300 feet ahead of the pipe-laying crew, unless given permission by the City Engineer. The trench shall be backfilled so that no section of the trench or pipe is left open longer than 24 hours. Steel traffic plates shall be on-site before work begins for street cuts on all arterial and collector streets. Steel plates may be required on some local streets, to allow the street to be reopened in the event that unforeseen circumstances prevent the work from being completed in a reasonable time. Under no circumstances shall any street be left in an 'open' situation when the contractor leaves the site.

## **170.6 PRESERVATION, RESTORATION, AND CLEANUP**

### **A. Site Restoration and Cleanup**

The Contractor shall keep the premises clean and orderly at all times during the work and leave the project free of rubbish or excess materials of any kind upon completion of the work. During construction, the Contractor shall stockpile excavated materials so as to do the least damage to adjacent lawns, grassed areas, gardens, shrubbery, trees, or fences, regardless of the ownership of these areas. All excavated materials shall be removed from these areas, and these surfaces shall be left in a condition equivalent to their original condition and free from all rocks, gravel, boulders, or other foreign material. Stockpiling of construction materials shall not be allowed on existing sidewalks or the driving surface of existing streets.

All existing storm systems shall be cleaned and flushed, and original drainage restored. Sediment, rock, and other debris shall be collected and disposed of in a proper manner. In no case shall debris be flushed down a storm or sanitary sewer for disposal. All damaged irrigation and house drainage pipe, drain tiles, sewer lateral, and culverts shall be repaired expeditiously.

All areas disturbed by the Contractor's operations inside dedicated rights-of-way or easements shall be restored to original condition. Areas outside of the easements or rights-of-way which are disturbed by the Contractor's operations shall be graded and reseeded in a method acceptable to the property owner. The Contractor shall obtain a written release from such property owners for any claims of injury or property damage prior to final acceptance of the work by the City.

### **B. Street Cleanup**

The Contractor shall clean all spilled dirt, gravel, or other foreign material caused by the construction operations from all streets and roads at the conclusion of each day's operation. Cleaning shall be by grader and front-end loader, supplemented by power brushing, and hand labor, unless otherwise approved by the City. The contractor shall follow the City's and the Unified Sewerage Agency's erosion control procedures.

As soon as practical after completion of all paving and gravel shoulder resurfacing, the Contractor shall remove all dirt, mud, rock, gravel, and other foreign material from the paved surface and storm drainage system.

### **C. Dust Prevention**

During all phases of the work, the Contractor shall take precautions to abate any dust nuisance by cleaning up, sweeping, sprinkling with water, or other means as

necessary to accomplish results satisfactory to the City. Dust prevention measures shall be continuous until final acceptance by the City. Obtaining water from a hydrant will require specific authorization from the applicable water jurisdiction.

D. Stream and Creek Crossings.

The Contractor shall comply with all provisions of the permits required by the Oregon Division of State Lands and the U.S. Army Corps of Engineers.

Before any work may be performed in any stream, the method of operation and the schedule of such work shall be approved in writing by the Engineer. Work within major streams shall be scheduled to take place as specified in the applicable permits for such work, and once started, shall be completed without interruption of the work. Mechanized equipment shall enter streams only when necessary and only within the immediate work area.

## **170.7 INTERFERENCES AND OBSTRUCTIONS**

A. General.

Various obstructions may be encountered during the course of the work. Although maps and information regarding underground utilities should be obtained from the utility owning and operating such utilities, the location of such utilities is not guaranteed. A minimum of forty-eight (48) hours notice shall be given to all utility operators which may be affected by the construction operation. Should services of any utility be interrupted due to the construction operation, the proper authority shall be notified immediately.

B. Protection.

The Contractor shall exercise all due care in protecting property along the route of the improvement. This protection shall include, but not be limited to, trees, yards, fences, drainage lines, mail boxes, driveways, shrubs, and lawns. If any of the above have been disturbed, they shall be restored to as near their original condition as possible.

## **170.8 RAILROAD CROSSINGS**

A. General.

Crossings of railroad rights-of-way shall be done in a manner which conforms with the requirements of the railroad having jurisdiction. If any bonds and/or certificates of insurance protection are required, they shall be furnished by the Contractor or Owner to the railroad company with the City as an additionally-named insured.

B. Permits or Easements.

Crossing agreements, permits, and/or easements for such crossings will be obtained by the applicant and all the terms of such permits or easements shall be met by the Owner and Contractor.

## **180 ENVIRONMENTAL PROTECTION DURING CONSTRUCTION**

### **180.1 GENERAL POLICY AND REQUIREMENTS**

- A. It is the policy of the City of Beaverton to require temporary and permanent measures for all construction projects to lessen the adverse effects of construction on the environment.

The Contractor shall properly install, operate, and maintain both temporary and permanent works as provided in this section or in an approved plan, to protect the environment during the term of the project.

The City may, in addition, require that a construction project be scheduled so as to minimize erosion or other environmental harm.

Nothing in this section shall relieve any person from the obligation to comply with the regulations or permits of any federal, state, or other local authority.

- B. For any project having slopes equal or greater than ten percent, or where any portion of the work will occur within 200 feet of a lake, stream, river, or riparian area, an environmental protection plan shall be required. The plan shall be submitted together with construction plans, and when reviewed and approved by the City, shall constitute a part of the Site Development Permit.
- C. The plan shall describe all areas of the subject property affected by the project, and shall include all measures to be taken by the contractor to prevent or minimize erosion, loss of vegetation, water pollution, loss of fish or wildlife habitat, or other damage to the environment. The plan shall include all schedules, construction methods, structures, revegetation, and other actions affecting environmental quality, and shall address the criteria of Section 180.3 - 180.9.
- D. For all projects, whether or not an environmental protection plan is required, the prohibitions and regulations of this section shall apply. Notwithstanding the terms of any approved environmental project plan, the City may temporarily suspend the work or require additional protection measures if it appears, based upon observed conditions of the project, that the approved plan is insufficient to prevent environmental harm, and that such suspension or additional measures will prevent or minimize such harm.

## **180.2 AIR POLLUTION CONTROL**

### **A. Dust**

Dust shall be minimized to the extent practicable, utilizing all measures necessary, including, but not limited to:

1. Sprinkling haul and access roads and other exposed dust producing areas with water. Obtaining water from a hydrant will require specific authorization from the applicable water jurisdiction.
2. Applying DEQ approved dust palliatives on access and haul roads.
3. Establishing temporary vegetative cover.
4. Placing wood chips or other effective mulches on vehicle and pedestrian use areas.
5. Maintaining the proper moisture condition on all fill surfaces.
6. Pre-wetting cut and borrow area surfaces.
7. Use of covered haul equipment.

### **B. Fumes, Smoke, and Odors**

1. Tires, oils, paints, asphalt's, coated metals, or other such materials will not be permitted in combustible waste piles, and will not be burned at the construction site.
2. Open burning shall not be permitted unless approved by the Department of Environmental Quality and the City Fire Marshal's Office.
3. Open burning shall not be permitted within 1,000 feet of a structure or within 250 feet of the drip line of any standing timber or flammable growth.
4. Open burning shall not be permitted during a local air inversion or other climatic conditions that may result in a smoke pall hanging over a built-up area or community.
5. Open burning shall not be permitted when climatic and moisture conditions are contributing to high danger of forest or range fires as determined by city, state, or federal authorities.

6. All open burning shall be constantly attended by a crew with a supply of fire-fighting tools and equipment. The number and size of fires shall be limited such that the burning crew can adequately control them.

### **180.3 EROSION CONTROL**

The City of Beaverton has adopted the Unified Sewerage Agency's Resolution and Order 91-47 and as amended by Resolution and Order 91-75. All construction standards must meet or exceed these requirements for the installation and maintenance of erosion control devices.

The City has the following notations in addition to the USA adopted standards:

- A. Measures to prevent erosion at construction sites shall be incorporated into the construction drawings and specifications.
- B. All earth and soft or broken rock areas that have been disturbed by construction operations such as during stripping, excavation, and by traffic shall be protected from erosion by the action of concentrated runoff, by the impact of falling rain, by wind action, by vehicular tracking, or a combination of actions.
- C. The concentration of runoff on or across slopes shall be prevented.
- D. Sections of bare earth and the length of time of their exposure to potential erosion shall be minimized by proper scheduling, limiting the work areas, and placement of appropriate cover.
- E. Precautions shall be taken in the use of construction equipment to prevent operations that increase the potential for erosion. Wheel tracks or ruts, particularly down slopes, that permit concentration of surface flows, shall be avoided. Fording of live streams that accelerate erosion and damage aquatic animal habitat shall be avoided. Where frequent stream crossings are necessary, temporary bridges shall be installed.
- F. Areas for borrow pits and waste disposal shall be selected with full consideration of erosion control needs during and after borrow operations.

### **180.4 MAINTAINING SURFACE WATER QUALITY**

- A. Construction between stream banks shall be kept to a minimum.
- B. Pollutants such as fuels, lubricants, bitumens, raw sewage, and other harmful materials shall not be discharged into or near rivers, streams, or impoundments.

Sterilizing water from water line construction activities shall not be directly discharged into the public storm drainage system. Activities and construction practices must comply with all Oregon Department of Environmental Quality (DEQ) rules and regulations regarding discharge of chlorinated water onto the ground, to any public or private storm drainage system, and/or that may reach a stream or creek. Contact DEQ for the current State statute and administrative rules.

- C. The use of water from a stream or impoundment shall not result in altering the temperature of the water body enough to affect aquatic life.

#### **180.5 FISH AND WILDLIFE HABITAT PRESERVATION**

- A. The construction shall be done in a manner to minimize the adverse effects on wildlife and fishery resources.
- B. The requirements of local, state, and federal agencies charged with wildlife and fish protection shall be adhered to by the entire construction work force.

#### **180.6 CONTROL OF NOISE LEVELS**

Construction noise shall be minimized by the use of proper engine mufflers, protective sound reducing enclosures, and other sound barriers. Construction activities producing excessive noise that cannot be reduced by mechanical means shall be restricted to locations where their sound impact is reduced to a minimum at the edge of the work area.

#### **180.7 NATURAL VEGETATION**

- A. As far as is practicable, the natural vegetation shall be protected and left in place. Work areas shall be carefully located and marked to reduce potential damage. Trees shall not be used as anchors for stabilizing working equipment.
- B. During clearing operations, trees shall not be permitted to fall outside the work area. In areas designated for selective cutting or clearing, care in falling and removing trees and brush shall be taken to avoid injuring trees and shrubs to be left in place.

#### **180.8 HISTORICAL AND ARCHAEOLOGICAL AREAS**

When burial sites, buried camp areas, village sites, and other distinctive archaeological or historical items are uncovered, or other items suspected of being of historical or archaeological significance are encountered, the Contractor shall report the matter to the City and the state liaison officer. Construction operations shall be stopped until the appropriate authorities can examine the area and give clearance to proceed with the work.

Under the Natural Historical Preservation Act, state liaison officers shall be notified when historical or archaeological items are unearthed.

The Oregon Criminal Code prohibits disinterment of a corpse without permission of the appropriate authorities.

### **180.9 USE OF PESTICIDES**

- A. The use of pesticides including insecticides, herbicides, defoliants, soil sterilants, and so forth, must strictly adhere to federal, state, county, and local restrictions. Time, area, method, and rate of application must be approved by all relevant authorities and their requirements followed.
- B. All materials delivered to the job site shall be covered and protected from the weather. None of the materials shall be exposed during storage. Waste material, rinsing fluids, and other such material shall be disposed of in such a manner that pollution of groundwater, surface water, or the air does not occur. In no case shall toxic materials be dumped into drainageways.
- C. All personnel shall stay out of sprayed areas for the prescribed time. All such areas should be fenced, appropriately signed, or otherwise protected to restrict entry.

### **190 REVISIONS**

Any revisions to the City approved plans shall come from the engineer of record. The submittal shall include 5 copies of the 24 by 36 inch revised pages (with the revisions clearly identified), along with a copy of any revised calculations. Applicants are cautioned that revisions must be reviewed for coordination with the entire plan set and that such reviews will be conducted in the order that the revisions are received, on a first come, first served basis.

End of Chapter